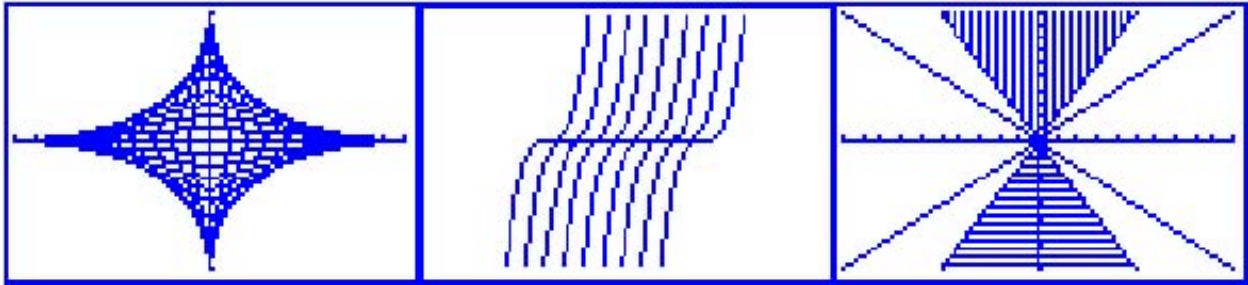


Art of Equations



Technology Lesson Plan

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Title of Lesson: Art of Equations

Subject: Algebra 1, Art 2 (Interdisciplinary Activity)

Grade(s): 9th and 10th

Description of Project or Narrative:

Prior to the class, students in Ms. Susan Pardue's Art 2 class will use the designs of basic equations to create patterns that Algebra 1 students will duplicate using a TI-83 Plus graphing calculator. During this activity, the Algebra students will work within a small group to create a design on the graphing calculator that illustrates the changes in graphs of basic equations that occur when coefficients and/or constants of the corresponding equations are changed. The students will copy their designs to a Word document and create a PowerPoint presentation to illustrate the designs.

Associated Curriculum Standards:

**Tennessee Mathematics Framework
Gateway for Algebra I**

Standard Number 3.0 Patterns, Functions, and Algebraic Thinking

Standard: The student will describe, extend, analyze, and create a wide variety of patterns and functions using appropriate materials and representations in real-world problem solving.

Specifically in this lesson, the student will accomplish the following learning expectations:

3.9 Analyze graphs to describe the behavior of functions.

3.18 Describe the transformation of the graph that occurs when coefficients and/or constants of the corresponding linear equations are changed.

Specific Performance Indicators:

At Level 3, TSW recognize the graphical transformation that occurs when coefficients and/or constants of the corresponding linear equations are changed.

Hardware and Software Required:

Laptop computers: 17 computers (one cart) plus one laptop

Wireless cart with network printer: 1

TI-83 Plus calculators: 30

TI-83 Plus calculator for overhead, and overhead projector

Microsoft Office and access to the Internet

Maple 5.0 (Mathematics software) was used to create the graphs used in [Transformations of Graphs of Equations.pdf](#) TI Graph Link for Windows for the TI 83 Plus and connecting serial port cable

Mini-Projector for Laptop

Floppy Disks for each group of students

Timeline:

- ❑ Scheduled Class Dates: May 9-10, 2002 3rd Block
- ❑ May 9th: Work with Ms. Susan Pardue's Art 2 class to explain the basic shapes associated with common equations: linear, cubic, quadratic, and absolute value equations. Explain how to construct patterns using Line Art. Collect their drawings for use in the Algebra class on May 10th.
- ❑ May 9th: 80 minutes. Algebra students are introduced to the activity and begin work with graphing calculators to accomplish designs that are part of Task 2. Art of Equations2.pdf
- ❑ May 10th:
 - ❑ Prior to 3rd block:
 - ❑ Set up mini-projector and test connection from the cart to the network
 - ❑ Check signal strength of wireless network
 - ❑ 0-10 min: Record class attendance; issue students laptop computers and calculators.

Timeline: (continued)

- 11-20 min: Students are issued calculators and computers and receive instructions on logging into the network using the ID: .stulib.student.mjh.wcs, or stulib
- 21-70 min: Students open the Word document [Art of Equations.pdf](#) and complete the three tasks.
- 71-90 min: Students turn in computers and calculators.

Teacher Preparation:

Prepare the slides for use in explaining the activity to the Art 2 student:

[Supporting graphic files\Line Designs2.pdf](#)

[Supporting graphic files\Line Art.pdf](#)

[Supporting graphic files\absolute value.pdf](#)

[Supporting graphic files\Abs value 1.pdf](#)

[Supporting graphic files\x square.pdf](#)

[Supporting graphic files\parabola and abs value color.pdf](#)

[Supporting graphic files\x cubed.pdf](#)

[Supporting graphic files\x cubed pattern.pdf](#)

Print basic calculator screen patterns for the Art 2 students to use as they draw their designs:

[Supporting graphic files\Grid 2.pdf](#)

[Supporting graphic files\Grid Double.pdf](#)

Prerequisite Skills Needed:

Given examples of the graphs of linear, quadratic, cubic, and absolute value equations, TSW be able to recognize the graphs corresponding to the equations and be able to shift the graphs horizontally and vertically using a TI 83 Plus graphing calculator.

Activities and Procedures:

Students will watch the presentation at [Transformations of Graphs of Equations.pdf](#) and complete the activities at [Art of Equations.pdf](#).

Sample(s) of Student Work:

See the PowerPoint Presentation: [Art of Equations Samples Student Work.pdf](#)

Assessment and Evaluation:

Evaluation: for Art of Equations. Each member of the group will receive the grade assigned to the group.

TASK	Beginning 1	Developing 2	Accomplished 3	Exemplary 4
<p>Create patterns on the graphing calculator that will duplicate the patterns created by the art students</p>	<p>Equations are manipulated on the graphing calculator by changing coefficients and/or constants to create patterns that are similar to those created by students in the art class.</p> <p>Both the screen containing the equations used and the screen containing the pattern are saved to a Word Document file.</p>	<p>Equations are manipulated on the graphing calculator by changing coefficients and/or constants to create patterns that approximate those created by students in the art class.</p> <p>Both the screen containing the equations used and the screen containing the pattern are saved to a Word Document file.</p> <p>The pattern used illustrates transformations of the graphs of equations.</p>	<p>Equations are manipulated on the graphing calculator by changing coefficients and/or constants to create patterns that approximate those created by students in the art class.</p> <p>Both the screen containing the equations used and the screen containing the pattern are saved to a Word Document file.</p> <p>The pattern used is interesting and illustrates transformations of the graphs of equations.</p>	<p>Equations are manipulated on the graphing calculator by changing coefficients and/or constants to create patterns that closely match those created by students in the art class.</p> <p>Both the screen containing the equations used and the screen containing the pattern are saved to a Word Document file.</p> <p>The pattern used is challenging to create and illustrates transformations of the graphs of equations.</p>
Continued on the next page				
Design your own	At least one	At least one	At least one	At least one

TASK	Beginning 1	Developing 2	Accomplished 3	Exemplary 4
<p>patterns on the graphing calculator by manipulating equations. If needed, add interest to your design by using the Line Art program or the Draw feature.</p>	<p>basic equation is used to create the pattern. The pattern involves the use of transformations to create the design, not just using the Line art program. The equations used are recorded. The procedures used to create the pattern, such as using the Draw feature or Line art program is described on the Word Document and saved to a file.</p> <p>Both the screen containing the equations used and the screen containing the pattern are saved to a Word Document file.</p> <p>0-20 Points</p>	<p>basic equation is used to create the pattern. The pattern involves the use of transformations to create the design, not just using the Line art program. The equations used are recorded. The procedures used to create the pattern, such as using the Draw feature or Line art program is described on the Word Document and saved to a file.</p> <p>Both the screen containing the equations used and the screen containing the pattern are saved to a Word Document file.</p> <p>0-20 Points</p>	<p>basic equation is used to create the pattern. The pattern involves the use of transformations to create the design, not just using the Line art program. The equations used are recorded. The procedures used to create the pattern, such as using the Draw feature or Line art program is described on the Word Document and saved to a file.</p> <p>Both the screen containing the equations used and the screen containing the pattern are saved to a Word Document file.</p> <p>0-20 Points</p>	<p>basic equation is used to create the pattern. The pattern involves the use of transformations to create the design, not just using the Line art program. The equations used are recorded. The procedures used to create the pattern, such as using the Draw feature or Line art program is described on the Word Document and saved to a file.</p> <p>Both the screen containing the equations used and the screen containing the pattern are saved to a Word Document file.</p> <p>0-20 Points</p>
Continued on the next page				
Create a	The presentation	The presentation	The presentation	The presentation

TASK	Beginning 1	Developing 2	Accomplished 3	Exemplary 4
PowerPoint presentation that illustrates the patterns created on the graphing calculator.	includes the names of the algebra students and the art students involved in creating the pattern. The presentation identifies the basic equation shapes that are used to create the pattern.	includes the names of the algebra students and the art students involved in creating the pattern. The presentation identifies the basic equation shapes that are used to create the pattern. The PowerPoint presentation includes appropriate color schemes, transitions, sounds, or animations.	includes the names of the algebra students and the art students involved in creating the pattern. The presentation identifies the basic equation shapes that are used to create the pattern. The PowerPoint presentation includes appropriate color schemes, transitions, sounds, or animations. The presentation reflects creativity and is interesting.	includes the names of the algebra students and the art students involved in creating the pattern. The presentation identifies the basic equation shapes that are used to create the pattern. The PowerPoint presentation includes appropriate color schemes, transitions, sounds, or animations. The presentation reflects creativity and is interesting.
	0-30 points	0-45 points	0-55 points	0-60 points
Total Possible Score	0-70 Points	0-85 Points	0-95 points	0-100 points

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Follow-up Activities:

Follow-up activities could include taking pictures using a digital camera within the school or local community of structures that resemble the basic shapes of the graphs of linear, quadratic, cubic, and absolute value equations. The pictures could be used to create a PowerPoint presentation illustrating the use of the different types of shapes in real life.

Students could also talk to Precalculus students or Trigonometry students to learn how the coefficients and constants added to the basic trigonometric functions affect transformations in trigonometric graphs.

Other Resources:

Thanks to Susan Pardue for letting her Art 2 class participate in this activity and create designs for the Algebra students to duplicate using technology.

One overhead projector, with extra bulb